CLAIMS

1. A thin film forming method for plasmatizing a mixture gas, the mixture gas consisting of a monomer gas and an oxidizing reactive gas, and for forming a thin film on a surface of a substrate, the thin film being made of an oxide, comprising:

a first step of forming a first thin film by plasmatizing the mixture gas while varying a flow amount ratio of the monomer gas with respect to the reactive gas under the condition that the flow amount ratio is in at least a specific range.

2. A thin film forming method according to Claim 1, wherein the flow amount ratio decreases continuously in the first thin film forming step.

3. A thin film forming method according to Claim 2, wherein an initial value of the flow amount ratio in the first thin film forming step is in a range of 0.02 to 0.2.

4. A thin film forming method according to Claim 2 or 3, further comprising:

a second step of forming the thin film by increasing the flow amount ratio after the first thin film forming step.

5. A thin film forming method according to any one of Claims 1 to 4, wherein the mixture gas is plasmatized by controlling reflected power to be 10% or lower than supplied high frequency power, the reflected power being generated by supplying high frequency power of 100 MHz or lower to a high frequency electrode through an impedance matching network.

6. A thin film forming device for plasmatizing a mixture gas, the mixture gas consisting of a monomer gas and an oxidizing reactive gas, and for forming a thin film, on an inner surface of a cylindrical container having a closed end, the thin film being made of an oxide, comprising:

a plurality of thin film forming chambers, each of the thin film forming chambers being provided with a cylindrical high frequency electrode, one end of the high frequency electrode being closed such that the cylindrical container can be disposed on an inner surface of the high frequency electrode, and a ground electrode disposed in the cylindrical container, the ground electrode having a gas generating port on a tip section of the ground electrode such that the gas generating port generates the mixture gas;

a high frequency power supply section having an impedance matching network and a high frequency power supply such that high frequency power can be supplied to the high frequency electrode through the impedance matching network; and

a flow amount control section for controlling a flow amount ratio of the monomer gas and the reactive gas contained in the mixture gas, wherein

the high frequency power is supplied to a plurality of the thin film forming chambers from the high frequency power supply section.

7. A thin film forming device according to Claim 6, wherein a detachable spacer which is formed by an insulative member is disposed between the cylindrical container and the high frequency electrode.

8. A thin film forming device according to Claim 6 or 7, wherein the gas generating port has at least a hole of which the diameter is 0.5 mm or smaller and/or a slit of which the width is 0.5 mm or narrower.

9. A thin film forming device according to any one of Claims 6 to 8, wherein an average surface roughness of an outer surface of the ground electrode is 5 to 50 μm.

10. A thin film forming device according to any one of Claims 6 to 8, wherein a detachable cover pipe is provided on at least a part of an outer periphery of the ground electrode, and an average surface roughness of an outer surface of the cover pipe is 5 to 50 μm.

11. A thin film forming device according to Claim 9 or 10, wherein a metal member or a ceramic member is sprayed onto the outer surface which has the average surface roughness.

12. A thin film forming process monitoring method for plasmatizing a mixture gas, the mixture gas consisting of an organosilicon compound gas and an oxidizing gas, and for forming a silicon oxide thin film on a surface of a substrate, comprising:

measuring an intensity of hydrogen alpha rays radiated from the plasma and an intensity of oxygen radiation rays;

comparing the intensity of the hydrogen alpha rays and the intensity of the oxygen radiation rays, with an already measured intensity of hydrogen alpha rays and an already measured intensity of the oxygen radiation rays, for which the silicon oxide thin film has a desirable surface quality; and

determining whether or not the silicon oxide thin film having a desirable surface quality is formed.

13. A thin film forming process monitoring method according to Claim 12 wherein the intensity of the hydrogen alpha rays and the intensity of the oxygen radiation rays are measured by extracting radiation rays which have a specific range of wavelengths from among radiation rays which are radiated from the plasma, and measuring the intensity thereof.

14. A thin film forming process monitoring method according to Claim 12, wherein the intensity of the hydrogen alpha rays and the intensity of the oxygen radiation rays are measured by measuring an intensity of radiation rays which have 656 ±5 nm wavelength range and an intensity of radiation rays which have 777± 5 nm wavelength range among the radiation rays which are radiated from the plasma.

15. A thin film forming device, comprising:

a chamber for plasmatizing a mixture gas, the mixture gas consisting of an organosilicon compound gas and an oxidizing gas, and for forming a silicon oxide thin film on a surface of a substrate;

a measuring section for measuring an intensity of hydrogen alpha rays and an intensity of oxygen radiation rays, both kinds of rays being radiated from the plasma in the chamber;

a storage section for storing the intensity of the hydrogen alpha rays and the intensity of the oxygen radiation rays such that the organosilicon thin film has a predetermined desirable surface quality; and

a determining section for determining whether or not the intensity of the measured hydrogen alpha rays and the intensity of the measured oxygen radiation rays are within specific ranges by comparing the intensity of the measured hydrogen alpha rays

with the intensity of the hydrogen alpha rays in the storage section, and by comparing the intensity of the oxygen radiation rays measured by the measuring section with the intensity of the oxygen radiation rays which is stored in the storage section.

16. A thin film forming device according to Claim 15, wherein the measuring section is provided with a bandpass filter for separating only radiation rays having a specific wavelength range from among the rays which are radiated from the plasma in the chamber.

17. A thin film forming device according to Claim 15, wherein the measuring section comprises:

a first bandpass filter of which a transmittance for the radiation rays which have a wavelength range outside 656 ±5 nm is 1% or lower;

a second bandpass filter of which a transmittance for the radiation rays which have a wavelength range outside 777 ±5 nm is 1% or lower;

a first photosensor which receives the radiation rays which pass through the first bandpass filter; and

a second photosensor which receives the radiation rays which pass through the second bandpass filter.